

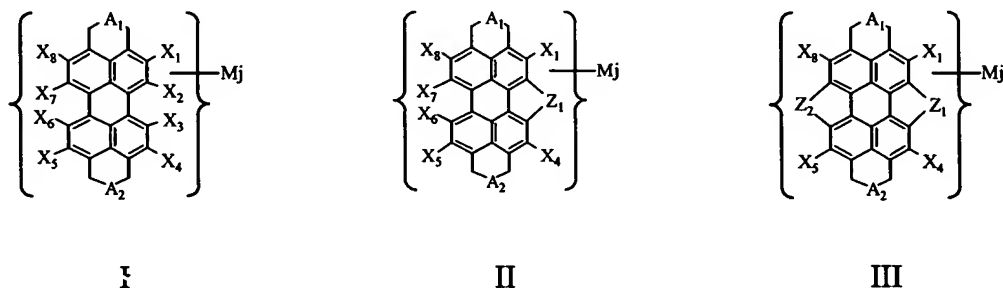
## CLAIMS

What is claimed is:

1. A sulfoderivative compound, comprising:

a sulfonated perylenetetracarboxylic acid dibenzimidazole (PTCA DBI) having a general

5 structural formula selected from one of

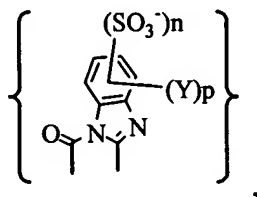


where  $X_1$ ,  $X_2$ ,  $X_3$ ,  $X_4$ ,  $X_5$ ,  $X_6$ ,  $X_7$ , and  $X_8$  are peripheral substituents individually selected from  $-H$ ,  $-OH$ , and  $-SO_3H$ , such that at least one of the peripheral substituents is not  $H$ ;

$M$  is one or more counter ions and  $j$  is the number of counter ions associated with a molecule;

10  $Z_1$  and  $Z_2$  are bridging substituents individually selected from  $-O-$ ,  $-SO_2-$ ,  $-SO_2O-$ ;

$A_1$  and  $A_2$  are fragments having the general structural formula



$Y$  is one or more fragments substituents individually selected from  $-H$ ,  $-Cl$ ,  $-F$ ,  $-Br$ ,  $-Alk$ ,  $-OH$ ,  $-OAlk$ ,  $-NO_2$ , and  $-NH_2$ ;

15  $n$  is an integer selected from 0, 1, and 2; and

$p$  is an integer selected from 0, 1, 2, 3, and 4.

2. The sulfoderivative of Claim 1, wherein fragments  $A_1$  or  $A_2$  together comprise at least one sulfo group.

3. The sulfoderivative of Claim 1, wherein the counter ion or counter ions are shared by more than one sulfoderivative molecule.

4. The sulfoderivative of Claim 1, wherein the counter ion or counter ions, M, are individually selected from  $H^+$ ,  $NH_4^+$ ,  $K^+$ ,  $Li^+$ ,  $Na^+$ ,  $Cs^+$ ,  $Ca^{++}$ ,  $Sr^{++}$ ,  $Mg^{++}$ ,  $Ba^{++}$ ,  $Co^{++}$ ,  $Mn^{++}$ ,  $Zn^{++}$ ,  
5  $Cu^{++}$ ,  $Pb^{++}$ ,  $Fe^{++}$ ,  $Ni^{++}$ ,  $Al^{+++}$ ,  $Ce^{+++}$ , and  $La^{+++}$ .

5. The sulfoderivative of Claim 1, wherein the sulfoderivative is capable of forming a stable lyotropic liquid crystal system.

6. The sulfoderivative of Claim 1, wherein the sulfoderivative is capable of forming an optically isotropic or anisotropic film.

10 7. The sulfoderivative of Claims 1, wherein the sulfoderivative is capable of forming an at least partially crystalline film.

8. A lyotropic liquid crystal (LLC) system comprising at least one sulfoderivative of Claim 1.

9. The LLC system of Claim 8, wherein the LLC system is based on water.

15 10. The LLC system of Claim 8, wherein the LLC system is based on a mixture of water and an organic solvent miscible with water.

11. The LLC system of Claim 8, wherein the concentration of PTCA DBI sulfoderivatives in the LLC system is in the range of approximately 3% to 40% by mass.

12. The LLC system of Claim 8, further comprising up to 5% by mass of surfactants.

20 13. The LLC system of Claim 8, further comprising up to 5% by mass of plasticizers.

14. The LLC system of Claim 8, further comprising:

a sulfoderivative of structural formula I in a concentration range of approximately 0% to 99% by mass;

a sulfoderivative of structural formula II in a concentration range of approximately 0% to  
25 99% by mass; and

a sulfoderivative of structural formula III in a concentration range of approximately 0% to 50% by mass.

15. The LLC system of Claim 8, further comprising:

5 a sulfoderivative of structural formula I in a concentration range of approximately 0% to 50% by mass;

a sulfoderivative of structural formula II in a concentration range of approximately 0% to 70% by mass; and

a sulfoderivative of structural formula III in a concentration range of approximately 0% to 20% by mass.

10 16. The LLC system of Claim 8, further comprising at least one water-soluble organic dye or an organic compound, the organic dye or organic compound being capable of participating in the formation of the LLC system having at least one sulfoderivative of structural formulas I, II, and III.

17. An optically anisotropic film comprising at least one sulfoderivative of Claim 1.

15 18. The optically anisotropic film of Claim 17, wherein the film is formed by depositing a lyotropic liquid crystal system comprising at least one sulfoderivative derivative compound.

19. The optically anisotropic film of Claim 17, wherein the film is at least partially crystalline.

20 20. The optically anisotropic film of Claim 19, wherein interplanar spacing in a crystal is in the range of approximately 3.1 Å to 3.7 Å along one of the optical axes.

21. The optically anisotropic film of Claim 17, comprising:

a sulfoderivative of structural formula I in a concentration range of approximately 0% to 99% by mass;

25 a sulfoderivative of structural formula II in a concentration range of approximately 0% to 99% by mass; and

a sulfoderivative of structural formula III in a concentration range of approximately 0% to 50% by mass.

22. The optically anisotropic film of Claim 17, comprising:

a sulfoderivative of structural formula I in a concentration range of approximately 0% to

5 50% by mass;

a sulfoderivative of structural formula II in a concentration range of approximately 0% to 70% by mass; and

a sulfoderivative of structural formula III in a concentration range of approximately 0% to 20% by mass.

10 23. The optically anisotropic film of Claim 17, further comprising at least one water-soluble organic dye.

24. The optically anisotropic film of Claim 17, wherein the film is polarizing.

25. The optically anisotropic film of Claim 17, wherein the film is a retarder.

15 26. The sulfoderivative compound of Claim 1 wherein the sulfonated perylenetetracarboxylic acid dibenzimidazole (PTCA DBI) has a structural formula selected from one of

